

WHAT IS CLAIMED IS:

1. A method of producing a semiconductor device by dividing a semiconductor wafer into separate pieces of semiconductor chips, the method comprising:

- 5 (a) a groove formation process for forming a groove with a pattern according to an outer contour of a semiconductor chip in a front surface of a semiconductor wafer;
- 10 (b) a process following the groove forming process for holding the semiconductor wafer by a wafer holding mechanism;
- 15 (c) a back surface grinding process for grinding, with a grinder, a back surface of the semiconductor wafer held by the wafer holding mechanism; and
- 20 (d) a finish timing determining process for detecting opening of a bottom face of the groove during the back surface grinding process and determining timing for finishing the back surface grinding process based on a result of the detection.

2. The method according to claim 1, wherein the finish timing determining process includes a process for detecting an electromagnetic wave passing through the
25 groove during the back surface grinding process.

3. The method according to claim 2, wherein the electromagnetic wave includes light.

4. The method according to claim 2, wherein the
5 electromagnetic wave includes microwave.

5. The method according to claim 1, wherein the finish timing determining process includes:

- (a) an air sucking process for sucking air inside the groove during the back surface grinding process;
- 10 (b) an air pressure monitoring process for detecting and monitoring air pressure inside the groove during the air sucking process; and
- (c) a finish timing determining process for determining timing for finishing the back
15 surface grinding process based on the air pressure detected during the air pressure monitoring process.

6. A grinding machine for grinding a back surface of a semiconductor wafer whose front surface is provided
20 with a groove with a pattern according to an outer contour of a desired semiconductor chip so as to divide the semiconductor wafer into separate pieces of semiconductor chips, the grinding machine comprising:

- (a) a wafer holding mechanism for holding the
25 semiconductor wafer;

- (b) a grinder for grinding the back surface of the semiconductor wafer held by the wafer holding mechanism;
 - (c) a penetration detecting mechanism for detecting opening of a bottom face of the groove formed in the semiconductor wafer held by the wafer holding mechanism; and
 - (d) a control section for determining timing for finishing the back surface grinding of the semiconductor wafer by the grinder based on a result of the detection by the penetration detecting mechanism.
7. The grinding machine according to claim 6, wherein the penetration detection mechanism is an electromagnetic wave sensor for detecting an electromagnetic wave passing through the groove formed in the semiconductor wafer.
8. The grinding machine according to claim 7, wherein the electromagnetic wave includes light and the electromagnetic wave sensor includes a light sensor.
9. The grinding machine according to claim 8, wherein the light sensor is disposed in either one of the wafer holding mechanism and the grinder, and detects light passing through the groove after being directed from a light source disposed in the other one of the wafer

holding mechanism and the grinder.

10. The grinding machine according to claim 8, wherein the control section determines the timing for finishing the back surface grinding of the semiconductor wafer by the grinder to be at a time when a prescribed time elapses after the light passing through the groove is detected by the light sensor.

11. The grinding machine according to claim 8, wherein the light sensor is held by the wafer holding mechanism and of a light emitting/receiving type for directing light toward the groove in the semiconductor wafer held by the wafer holding mechanism as well as for receiving light which returns after being reflected by the semiconductor wafer or the grinder.

12. The grinding machine according to claim 7, wherein the electromagnetic wave includes microwave and the electromagnetic wave sensor includes a microwave sensor.

13. The grinding machine according to claim 12, wherein the microwave sensor detects a microwave which passes through the groove formed in the semiconductor wafer after being directed toward between the grinder and the back surface of the semiconductor wafer held by the wafer holding mechanism from a microwave oscillator which is provided in association with the grinder.

14. The grinding machine according to claim 12, wherein

the microwave sensor is disposed in either one of the wafer holding mechanism and the grinder, and detects a microwave which passes through the groove formed in the semiconductor wafer held by the wafer holding mechanism
5 after being directed from a microwave oscillator disposed in the other one of the wafer holding mechanism and the grinder.

15. The grinding machine according to claim 12, wherein the control section determines the timing for finishing
10 the back surface grinding of the semiconductor wafer by the grinder to be at a time when a prescribed time elapses after the microwave passing through the groove is detected by the microwave sensor.

16. The grinding machine according to claim 6, wherein:
15 the penetration detecting mechanism includes an air sucking mechanism for sucking air inside the groove formed in the semiconductor wafer held by the wafer holding mechanism and an air pressure sensor for detecting air pressure inside the groove;

20 and wherein the control section determines the timing for finishing the back surface grinding of the semiconductor wafer by the grinder based on an output detected by the air pressure sensor.

17. The grinding machine according to claim 16, wherein
25 the control section detects a change in the air pressure

inside the groove by monitoring outputs of the air pressure sensor during the back surface grinding of the semiconductor wafer by the grinder, and determines the timing for finishing the back surface grinding of the semiconductor wafer by the grinder to be at a time
5 when a prescribed time elapses after the detection of the change in the air pressure.